

NLX Board Gauge User Manual

Version 1.1

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Revision History

Revision 1.0 to 1.1

- Section 2.2.1 (new): Added a Safety Warning, to make sure that no power is applied to riser card when inserting board gauge and to give special safety attention if design includes a lithium power source (battery) on the riser.
- Figure 4: Added callout, “Reserved Connector Area,” to emphasize fixed blocks on the 3.6" and 1.2" extension pieces.
- Section 2.2: Added paragraph to clarify and provide details about the fixed blocks representing keepout areas on the 3.6" and 1.2" extension pieces.

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1. Introduction

1.1 Abstract

This document is a user/application manual for the NLX Board Gauge, Version 1.0. More information and order details can be found on the NLX Web page at:

www.teleport.com/~nlx

The NLX Board Gauge is a “space model” that is intended as a tool to assist in mechanical evaluation, debug, and development of NLX-compliant PC chassis designs. The model can also be used for Network PC (Net PC) designs where the smallest form-factor applies (10"). The board gauge can be used as a GO - NOGO tester by installing it in the chassis to be evaluated.

1.2 NLX Board Gauge Features

The board gauge lets you

- Check for conformity to NLX Motherboard Specification V1.2
- Evaluate various motherboard sizes from 8" × 10" up to 9" × 13.6"
- Install and remove height-gauge blocks to check violation of exclusion (“keepout”) zones
- Check the chassis I/O aperture position, form, and dimensions by using the I/O window gauge
- Install standard (movable) NLX board rails
- Check for A.G.P. add-in board compatibility

The board gauge components can be adjusted to meet the various allowed motherboard sizes as defined by the NLX specification. The components are of robust, durable, and light-weight construction.

The components include a 10" aluminum base plate that represents an 8" × 10" motherboard size. Extension pieces can be added to the base plate to vary the size.

The components also include removable blocks that represent various keepout zones in an NLX-compliant design (as defined in the NLX specification). The blocks can be placed to check for impingement on the keepout zones. Because the blocks are removable, it is possible to install the board gauge fully into the chassis under evaluation, even when impingement of one of the keepout zones occurs. Therefore, a full evaluation (checking all keepout zones) is not prevented even after the first violation occurs.

The components include an I/O window gauge used to check the position, form, and dimensions of the chassis I/O aperture.

A subassembly emulates an NLX A.G.P. add-in board. This represents a full-length A.G.P. board and facilitates checking for A.G.P. add-in board compatibility.

Definitions:

- Baseboard—The 10" aluminum base plate that represents an 8" × 10" motherboard size.
- Board gauge—The baseboard with extensions and/or blocks added to create a space model.

2. Description

2.1 Baseboard and Extension Pieces

The board gauge includes a 10" aluminum base plate (baseboard) and several aluminum extension pieces that can be mated to form space models of the allowed NLX motherboard sizes. Figure 1 shows the baseboard and extension pieces.

- The extension pieces can be fastened to the 8" × 10" baseboard using the locator tongues and screws provided. The 1.2" and 3.6" extensions are fastened using the mounting holes for the (edge) board rail, thus preventing the edge rail from being installed incorrectly.
- The baseboard and extension pieces have a number of lantern dowels used to locate and retain the keepout blocks.

Table 1 lists the possible combinations of baseboard and extension pieces that can be used to model NLX board sizes, and Figure 2 represents allowed board size combinations.

Although the NLX specification allows for infinite variation in motherboard width (from 8" to 9"), the board gauge supports only two discreet widths (8" and 9"), and the 8" width can apply only to the 10" board. The board gauge therefore provides a subset of the allowed board sizes in the NLX specification.

Note that Net PC boards are 8.25" × 10". For Net PC evaluation, set the board gauge to 8" × 10" (the baseboard without any extensions) so it can be installed in a compliant Net PC chassis. In evaluating the chassis, allow for the extra width (0.25" / 6.35mm) of the Net PC motherboard.

Whatever the width of the motherboard, the NLX specification recommends a 0.3" (7.62mm) clearance to the inside back panel of the chassis. The board gauge has no mechanism for checking this clearance, so you must measure from the rear edge of the gauge.

2.1.1 Safety Warning

Although the baseboard and extension pieces are anodized, with a nonconductive coating, it is likely that repeated insertions into an NLX riser connector will wear through to the base metal. Therefore, you must take care to ensure that no power is applied to the riser card when the board gauge is inserted.



WARNING

Special attention and consideration must be given where designs include a lithium power source (battery) on the riser that supplies power to the NLX motherboard, because the battery could constitute an explosion hazard.

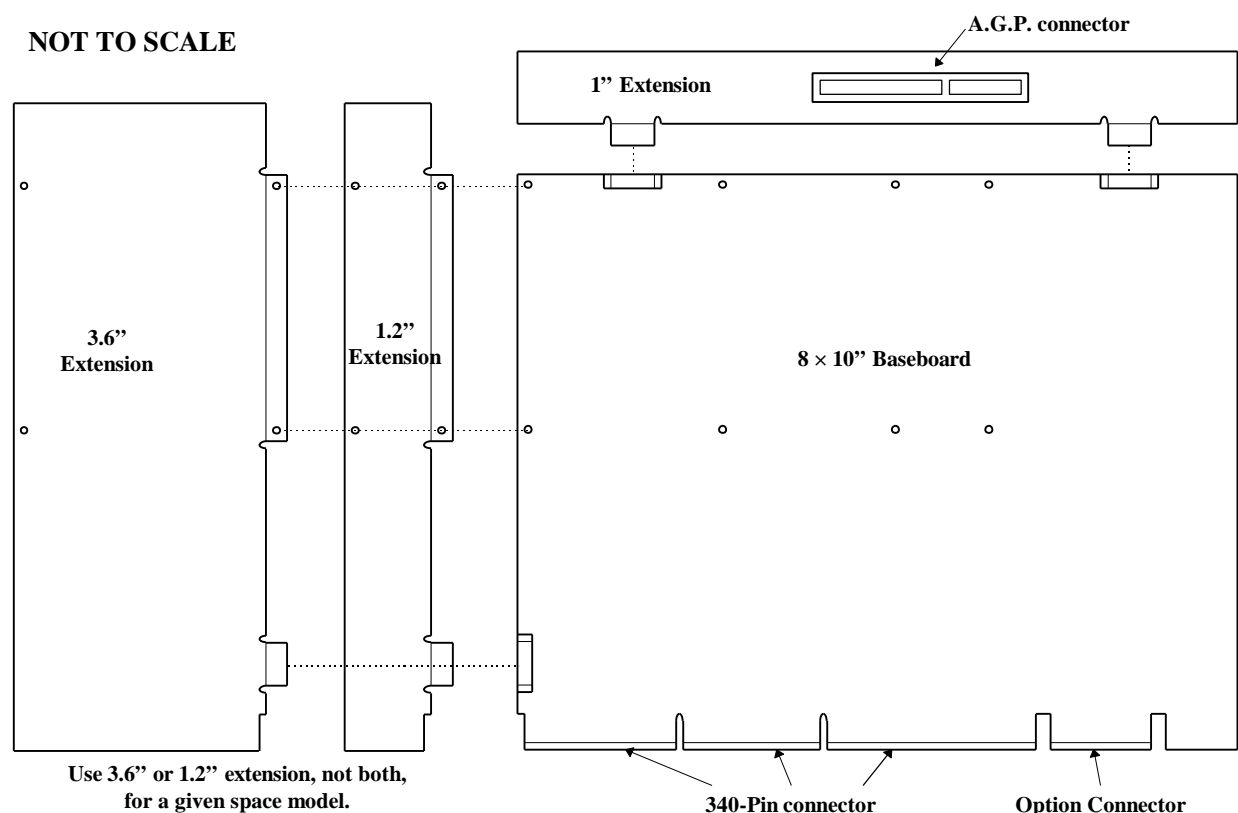


Figure 1: Baseboard and Extension Pieces

Table 1: Possible NLX Board Size Combinations

Board gauge combination	NLX board size supported
8" × 10" baseboard only	8" wide × 10" long, minimum size board
8" × 10" baseboard, plus extension: 1"	9" wide × 10" long, NLX with optional A.G.P. board support
8" × 10" baseboard, plus extensions: 1" and 1.2"	9" wide × 11.2" long, NLX with optional A.G.P. board support
8" × 10" baseboard, plus extensions: 1" and 3.6"	9" wide × 13.6" long, NLX with optional A.G.P. board support
8" × 10" baseboard, plus 1.2" extension	These are not valid board gauge combinations; the length extensions cannot be used without the 1" width extension.
8" × 10" baseboard, plus 3.6" extension	

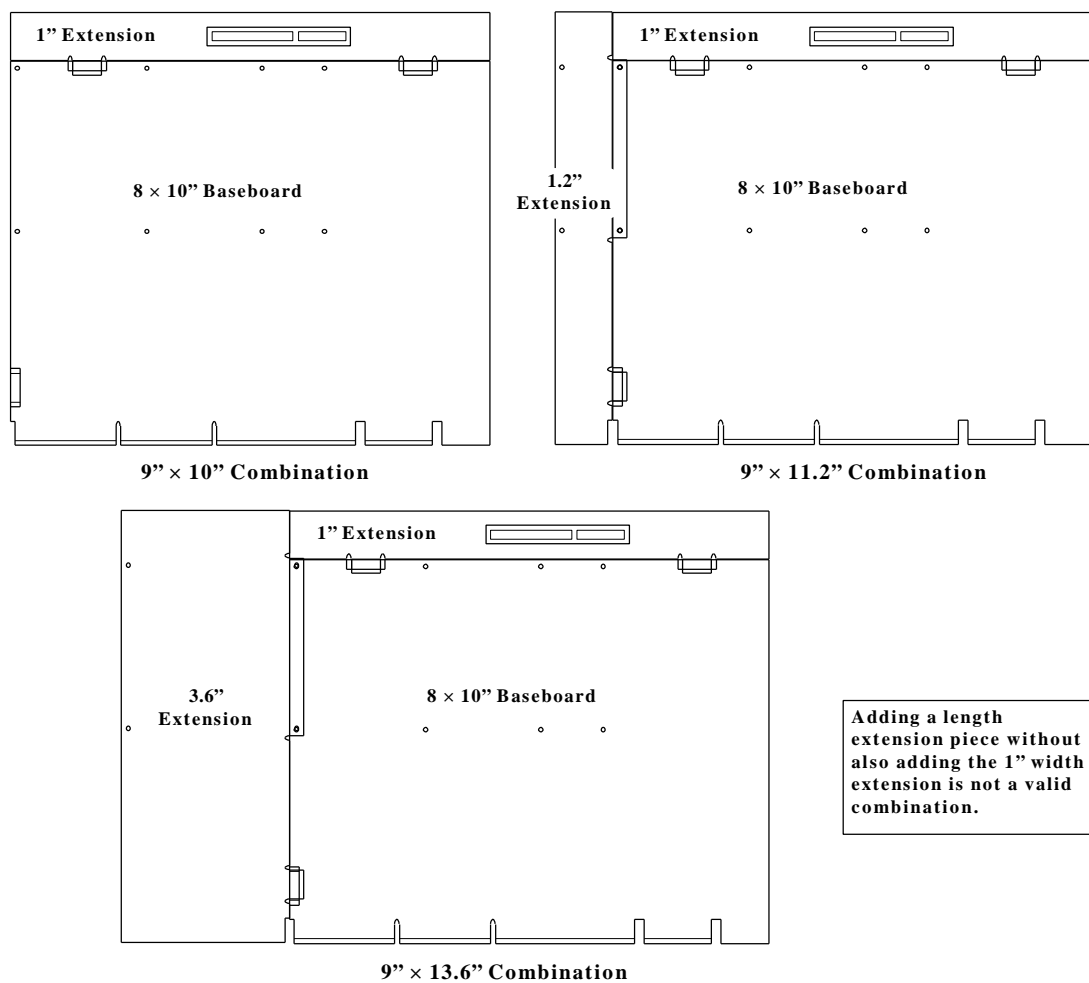


Figure 2: Allowed Board Size Combinations (besides 8" x 10" baseboard)

2.2 Board Rails

Two board rails (or “runners”) let you slide the gauge into the chassis under evaluation so the edge connector can mate with the riser connector (and option connector). The rails provided with the board gauge are precisely designed as defined in the NLX specification, although without EMI clips installed.

The specification defines a fixed distance (158.12mm / 6.225") between the rails for all three allowed lengths of motherboard. Figure 3 shows the rail mounting hole locations.

The board gauge (and the corresponding motherboard design) should always have two rails, both fastened to the secondary (under) side of the board. One attaches to the edge of the board, and the other attaches in-board.

- **Edge rail:** Whichever length the NLX gauge is set to (10", 11.2", or 13.6"), use the screws provided to attach one rail to the underside of the baseboard along the edge farthest from where the I/O shield would be. Attach this rail using the available holes at the edge of the baseboard. These holes are always 0.2" (5.08mm) in from the edge of the board. When you assemble a longer board gauge, you'll attach the 1.2" or 3.6" extension piece using the edge holes on the baseboard. So, to attach the edge rail on these longer models, use the edge holes on the extension piece.
- **In-board rail:** Attach the second rail in-board on the secondary side of the baseboard using the screws provided. Be careful to install this rail using the correct pair of mounting holes for the board length being modeled (10", 11.2", or 13.6"). See Figure 3.

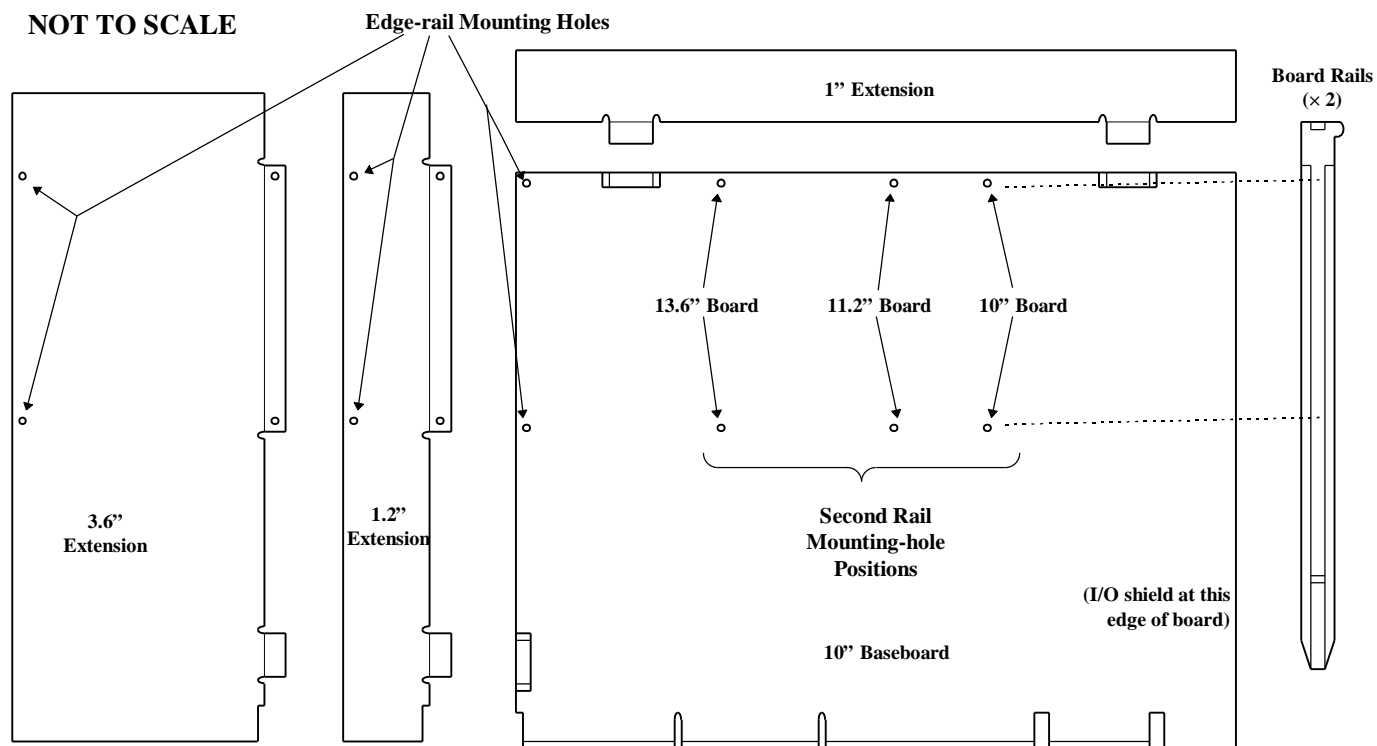


Figure 3: Board Rail Mounting Locations

2.3 Keepout Blocks

The keepout blocks are fabricated from a tough, light-weight, high-density polyurethane material. You can fit the blocks to the various baseboard and extension combinations to represent keepout zones as detailed in the NLX and A.G.P. specifications.

The blocks are keyed to fit in only the appropriate locations. Figure 4 shows locations by block height. The three blocks that fit the 1.2" extension can also fit the 3.6" extension to represent the additional keepout areas for 11.2" and 13.6" motherboards, respectively. In the lowest defined keepout areas (17.78mm, 0.7"), the blocks are fastened with screws instead of dowels on the 10" baseboard and the two extension pieces, because it is unlikely that impingement (violations) will occur in this area.

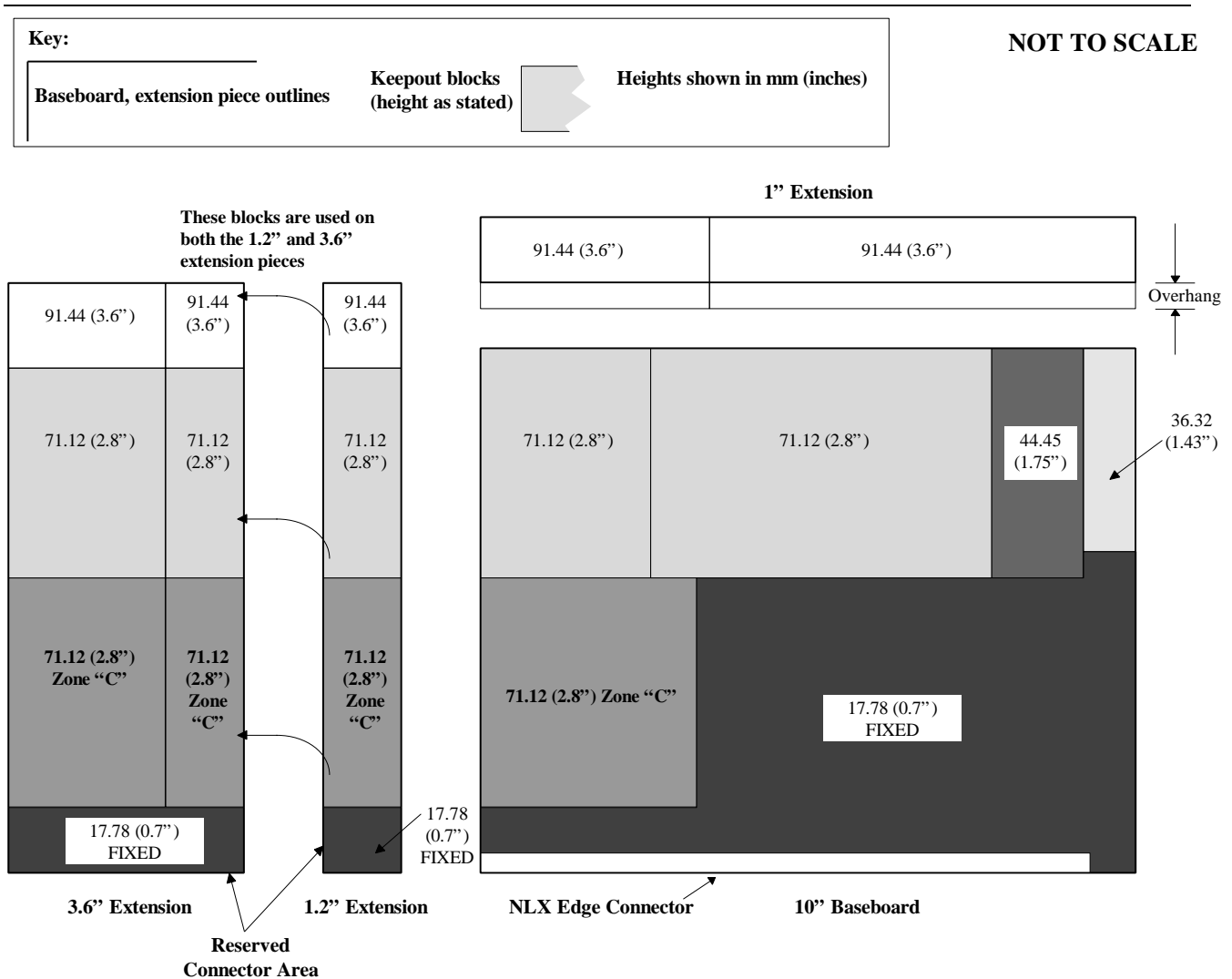


Figure 4: Keepout Block Location Diagram

Zone “C” is defined as optional in the NLX specification, and you can remove blocks to accommodate longer PCI plug-in cards. In this case, the height of the lowest fixed keepout block (17.78mm, 0.7”) should be assumed in the area of Zone C.

Both the 3.6” and 1.2” extension pieces have small fixed blocks representing a keepout height of 17.78mm (0.7”). These represent an area that is “reserved for future connections” in the NLX specification. However, the NLX specification does not show the baseboard extending into this region. It is possible that some riser designs (which do not make use of these additional connector[s]) will have components that “violate” the keepout area represented by these fixed blocks, but this space violation may be acceptable and depends on the chassis/product design. You can remove these blocks by removing the screws from the underside of the extension piece.

The 1” extension piece is specifically for A.G.P. support, and the keepout blocks associated with this section represent the required exclusions for an A.G.P. add-in board, as defined in the NLX specification. These blocks overhang the adjacent (lower) blocks on the 10” baseboard to create the specified exclusion volume when the board is 9” wide. However, for an 8” wide board (which does not support an A.G.P. add-in board), these keepout blocks do not apply.

In the NLX specification, the lower exclusion zones on the baseboard do not extend to the edge of an 8” wide board. With the NLX board gauge, however, these zones *have* been extended to the edge of the board. While the specification does not define the keepouts along the edge of an 8” board (which does not support an A.G.P. add-in board), these have been assumed to be extensions of the adjacent zones.

Where the board width is less than 9”, as in the case of Net PC designs (8.25”), assume that the exclusion volumes on the 10” baseboard extend to the edge of the board. In these cases, the model does not physically represent the board edge or the exclusion volumes; it is necessary to assume these and to pay particular attention to ensure there is no violation.

To insert the board gauge into the chassis, you may need to remove the keepout blocks (91.44mm / 3.6”) from the 1” extension piece. Doing so still allows a valid model, because this keepout volume represents the potential volume occupied by an A.G.P. board. In an actual system, an A.G.P. board would be inserted in the motherboard only after the motherboard is already installed in the chassis. Thus, the specification is not violated when impingement on this keepout volume occurs as the board gauge is inserted. However, after the board gauge is in place, the chassis must not impinge on the keepout volume for an A.G.P. board.

2.4 I/O Window Gauge

An I/O window gauge is shipped already fastened to one of the keepout blocks so that it is positioned correctly on the edge of the assembly. When you install the assembled board gauge into the chassis under evaluation, the window gauge provides a quick check on the form, position, and dimensions of the I/O aperture at the chassis back panel.

- The NLX specification defines the size and position of the I/O window and defines an associated tolerance of ± 0.01 ". The window gauge is manufactured to a tolerance of ± 0.0015 ".
- The NLX specification details the single-high and double-high section height dimensions as 22.50mm (0.886") and 42.93mm (1.69"), respectively. The window gauge dimensions are 0.0085" smaller (nominally). Figure 5 shows the nominal dimensions of the gauge.

The window gauge is manufactured from self-lubricating Delrin[†] material. It is fastened securely to the keepout block using shoulder-screws that allow 0.005" of movement.

Along with the window gauge, you can use the feeler gauge supplied to measure the size of the I/O window aperture. In a chassis where the I/O window is formed correctly, the window gauge should slide in easily. Insert the feeler gauge between the I/O window gauge and the edge of the I/O aperture to measure the actual height of the aperture. Take into consideration the tolerance of the I/O window gauge itself.

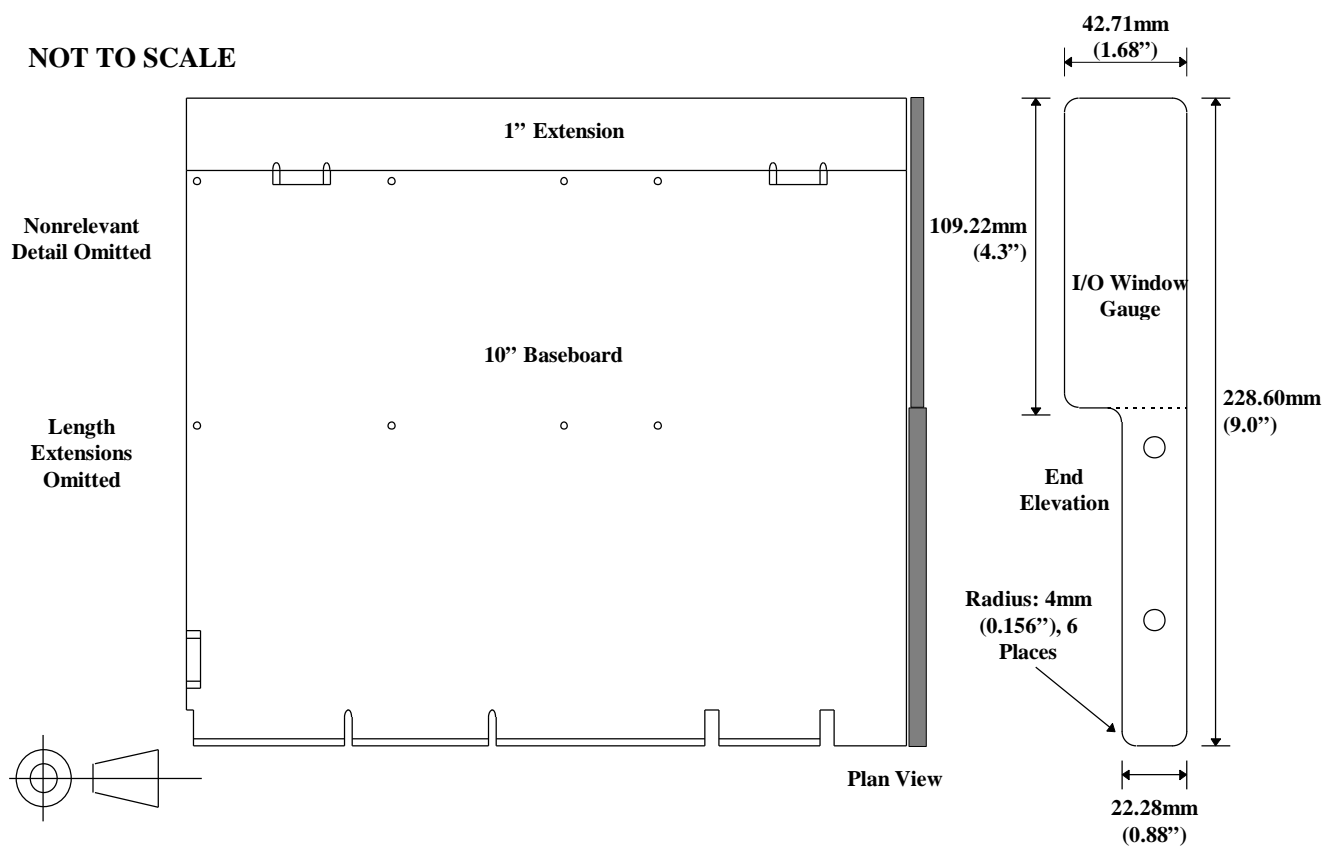


Figure 5: I/O Window Gauge Detail

2.5 A.G.P. Add-in Board Emulation

The 1" extension piece includes an A.G.P. connector so that the A.G.P. board emulator can be plugged in. You can also plug in an actual NLX A.G.P. board (see Figure 6). When installed, the keepout blocks on the 1" extension represent the volume that has been allocated for A.G.P.; with these blocks in place, the A.G.P. connector itself is obstructed.

During chassis evaluation, after determining that there is no impingement into the keepout for A.G.P., you can remove the height-gauge blocks from the 1" extension and install the A.G.P. board. This lets you check the chassis for full-length A.G.P. capability and ensures that the video shield (end bracket) mates correctly with the chassis back-panel.

You can install the blocks that represent the keepout volume for the A.G.P. board after installing the board gauge into the chassis. You do not need to be able to insert the board gauge with these blocks already installed, because they represent the volume required for the A.G.P. board. An A.G.P. board will be installed only after the board gauge (NLX motherboard) is in the chassis.

NOT TO SCALE

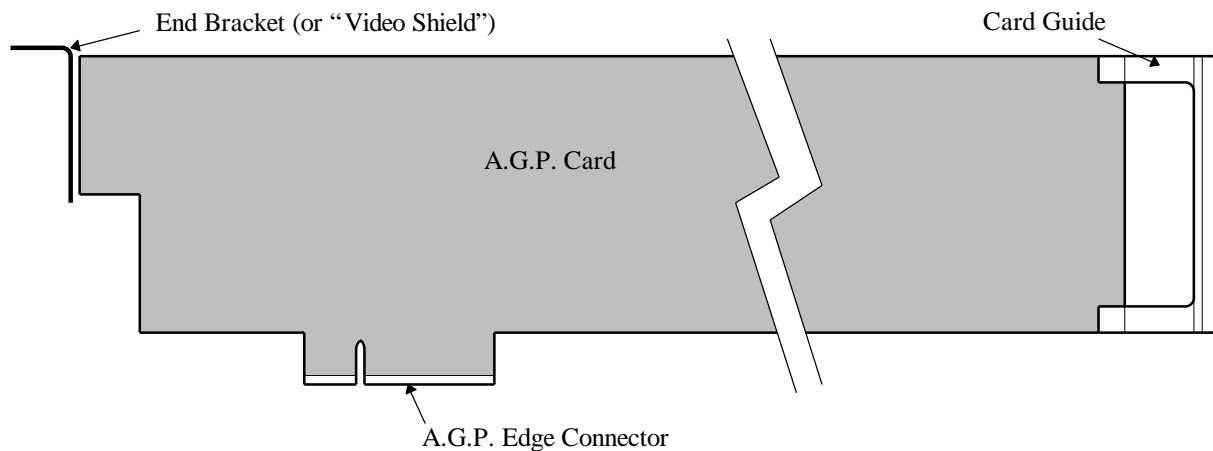


Figure 6: A.G.P. Add-in Board Sketch

3. Parts List

Table 2 lists components or subassemblies of the board gauge. Although some of the items contain subcomponents, dismantling beyond the level detailed here is outside the scope of normal use.

Table 2: Board Gauge Parts List

Item	Quantity	Description
1	1	10" Base Plate, 16 AWG Aluminum Alloy, Green Anodized (incl. dowels and 17.8mm height gauge block)
2	1	1.2" Extension, 16 AWG Aluminum Alloy, Green Anodized (incl. dowels and 17.8mm height gauge block)
3	1	3.6" Extension, 16 AWG Aluminum Alloy, Green Anodized (incl. dowels and 17.8mm height gauge block)
4	1	1" Extension, 16 AWG Aluminum Alloy, Green Anodized (including lantern dowels and A.G.P. connector)
5	13	Height Gauge Blocks (keepouts), various sizes, Lab-110 High-density polyurethane foam, Satin/Matt Black finish
6	1	I/O Window Gauge, Delrin, Black
7	2	Board Rails, Delrin, Black
8	6	Mounting Screws for board rails (and length extension pieces)
9	2	Mounting Screws for 1" width extension board
10	10	Fixing Screws for 17.8mm height gauge blocks
11	2	Fixing (Shoulder) Screws for I/O Window Gauge
12	1	Feeler Gauge
13	1	A.G.P. Emulator Board (full-length), 16 AWG Aluminium Alloy, Green Anodized. Including Video (End) bracket - 1mm mild-steel, zinc plated, and A.G.P. board-guide - cast resin: black.

4. Conversion Tables

See tables that follow.

Table 3: Millimeters (mm) to Inches

mm	0.000	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000
0.000	0.00	39.37	78.74	118.11	157.48	196.85	236.22	275.59	314.96	354.33	393.70
0.025	0.98	40.35	79.72	119.09	158.46	197.83	237.20	276.57	315.94	355.31	394.69
0.050	1.97	41.34	80.71	120.08	159.45	198.82	238.19	277.56	316.93	356.30	395.67
0.075	2.95	42.32	81.69	121.06	160.43	199.80	239.17	278.54	317.91	357.28	396.65
0.100	3.94	43.31	82.68	122.05	161.42	200.79	240.16	279.53	318.90	358.27	397.64
0.125	4.92	44.29	83.66	123.03	162.40	201.77	241.14	280.51	319.88	359.25	398.62
0.150	5.91	45.28	84.65	124.02	163.39	202.76	242.13	281.50	320.87	360.24	399.61
0.175	6.89	46.26	85.63	125.00	164.37	203.74	243.11	282.48	321.85	361.22	400.59
0.200	7.87	47.24	86.61	125.98	165.35	204.72	244.09	283.46	322.83	362.20	401.57
0.225	8.86	48.23	87.60	126.97	166.34	205.71	245.08	284.45	323.82	363.19	402.56
0.250	9.84	49.21	88.58	127.95	167.32	206.69	246.06	285.43	324.80	364.17	403.54
0.275	10.83	50.20	89.57	128.94	168.31	207.68	247.05	286.42	325.79	365.16	404.53
0.300	11.81	51.18	90.55	129.92	169.29	208.66	248.03	287.40	326.77	366.14	405.51
0.325	12.80	52.17	91.54	130.91	170.28	209.65	249.02	288.39	327.76	367.13	406.50
0.350	13.78	53.15	92.52	131.89	171.26	210.63	250.00	289.37	328.74	368.11	407.48
0.375	14.76	54.13	93.50	132.87	172.24	211.61	250.98	290.35	329.72	369.09	408.46
0.400	15.75	55.12	94.49	133.86	173.23	212.60	251.97	291.34	330.71	370.08	409.45
0.425	16.73	56.10	95.47	134.84	174.21	213.58	252.95	292.32	331.69	371.06	410.43
0.450	17.72	57.09	96.46	135.83	175.20	214.57	253.94	293.31	332.68	372.05	411.42
0.475	18.70	58.07	97.44	136.81	176.18	215.55	254.92	294.29	333.66	373.03	412.40
0.500	19.69	59.06	98.43	137.80	177.17	216.54	255.91	295.28	334.65	374.02	413.39
0.525	20.67	60.04	99.41	138.78	178.15	217.52	256.89	296.26	335.63	375.00	414.37
0.550	21.65	61.02	100.39	139.76	179.13	218.50	257.87	297.24	336.61	375.98	415.35
0.575	22.64	62.01	101.38	140.75	180.12	219.49	258.86	298.23	337.60	376.97	416.34
0.600	23.62	62.99	102.36	141.73	181.10	220.47	259.84	299.21	338.58	377.95	417.32
0.625	24.61	63.98	103.35	142.72	182.09	221.46	260.83	300.20	339.57	378.94	418.31
0.650	25.59	64.96	104.33	143.70	183.07	222.44	261.81	301.18	340.55	379.92	419.29
0.675	26.57	65.94	105.31	144.69	184.06	223.43	262.80	302.17	341.54	380.91	420.28
0.700	27.56	66.93	106.30	145.67	185.04	224.41	263.78	303.15	342.52	381.89	421.26
0.725	28.54	67.91	107.28	146.65	186.02	225.39	264.76	304.13	343.50	382.87	422.24
0.750	29.53	68.90	108.27	147.64	187.01	226.38	265.75	305.12	344.49	383.86	423.23
0.775	30.51	69.88	109.25	148.62	187.99	227.36	266.73	306.10	345.47	384.84	424.21
0.800	31.50	70.87	110.24	149.61	188.98	228.35	267.72	307.09	346.46	385.83	425.20
0.825	32.48	71.85	111.22	150.59	189.96	229.33	268.70	308.07	347.44	386.81	426.18
0.850	33.46	72.83	112.20	151.57	190.94	230.31	269.69	309.06	348.43	387.80	427.17
0.875	34.45	73.82	113.19	152.56	191.93	231.30	270.67	310.04	349.41	388.78	428.15
0.900	35.43	74.80	114.17	153.54	192.91	232.28	271.65	311.02	350.39	389.76	429.13
0.925	36.42	75.79	115.16	154.53	193.90	233.27	272.64	312.01	351.38	390.75	430.12
0.950	37.40	76.77	116.14	155.51	194.88	234.25	273.62	312.99	352.36	391.73	431.10
0.975	38.39	77.76	117.13	156.50	195.87	235.24	274.61	313.98	353.35	392.72	432.09
	1/1000 inch										

Table 4: Inches to Millimeters (mm)

inch	0.0000	0.1000	0.2000	0.3000	0.4000	0.5000	0.6000	0.7000	0.8000	0.9000	1.0000
0.0000	0.00	2.54	5.08	7.62	10.16	12.70	15.24	17.78	20.32	22.86	25.40
0.0025	0.06	2.60	5.14	7.68	10.22	12.76	15.30	17.84	20.38	22.92	25.46
0.0050	0.13	2.67	5.21	7.75	10.29	12.83	15.37	17.91	20.45	22.99	25.53
0.0075	0.19	2.73	5.27	7.81	10.35	12.89	15.43	17.97	20.51	23.05	25.59
0.0100	0.25	2.79	5.33	7.87	10.41	12.95	15.49	18.03	20.57	23.11	25.65
0.0125	0.32	2.86	5.40	7.94	10.48	13.02	15.56	18.10	20.64	23.18	25.72
0.0150	0.38	2.92	5.46	8.00	10.54	13.08	15.62	18.16	20.70	23.24	25.78
0.0175	0.44	2.98	5.52	8.06	10.60	13.14	15.68	18.22	20.76	23.30	25.84
0.0200	0.51	3.05	5.59	8.13	10.67	13.21	15.75	18.29	20.83	23.37	25.91
0.0225	0.57	3.11	5.65	8.19	10.73	13.27	15.81	18.35	20.89	23.43	25.97
0.0250	0.64	3.18	5.72	8.26	10.80	13.34	15.88	18.42	20.96	23.50	26.04
0.0275	0.70	3.24	5.78	8.32	10.86	13.40	15.94	18.48	21.02	23.56	26.10
0.0300	0.76	3.30	5.84	8.38	10.92	13.46	16.00	18.54	21.08	23.62	26.16
0.0325	0.83	3.37	5.91	8.45	10.99	13.53	16.07	18.61	21.15	23.69	26.23
0.0350	0.89	3.43	5.97	8.51	11.05	13.59	16.13	18.67	21.21	23.75	26.29
0.0375	0.95	3.49	6.03	8.57	11.11	13.65	16.19	18.73	21.27	23.81	26.35
0.0400	1.02	3.56	6.10	8.64	11.18	13.72	16.26	18.80	21.34	23.88	26.42
0.0425	1.08	3.62	6.16	8.70	11.24	13.78	16.32	18.86	21.40	23.94	26.48
0.0450	1.14	3.68	6.22	8.76	11.30	13.84	16.38	18.92	21.46	24.00	26.54
0.0475	1.21	3.75	6.29	8.83	11.37	13.91	16.45	18.99	21.53	24.07	26.61
0.0500	1.27	3.81	6.35	8.89	11.43	13.97	16.51	19.05	21.59	24.13	26.67
0.0525	1.33	3.87	6.41	8.95	11.49	14.03	16.57	19.11	21.65	24.19	26.73
0.0550	1.40	3.94	6.48	9.02	11.56	14.10	16.64	19.18	21.72	24.26	26.80
0.0575	1.46	4.00	6.54	9.08	11.62	14.16	16.70	19.24	21.78	24.32	26.86
0.0600	1.52	4.06	6.60	9.14	11.68	14.22	16.76	19.30	21.84	24.38	26.92
0.0625	1.59	4.13	6.67	9.21	11.75	14.29	16.83	19.37	21.91	24.45	26.99
0.0650	1.65	4.19	6.73	9.27	11.81	14.35	16.89	19.43	21.97	24.51	27.05
0.0675	1.71	4.25	6.79	9.33	11.87	14.41	16.95	19.49	22.03	24.57	27.11
0.0700	1.78	4.32	6.86	9.40	11.94	14.48	17.02	19.56	22.10	24.64	27.18
0.0725	1.84	4.38	6.92	9.46	12.00	14.54	17.08	19.62	22.16	24.70	27.24
0.0750	1.91	4.45	6.99	9.53	12.07	14.61	17.15	19.69	22.23	24.77	27.31
0.0775	1.97	4.51	7.05	9.59	12.13	14.67	17.21	19.75	22.29	24.83	27.37
0.0800	2.03	4.57	7.11	9.65	12.19	14.73	17.27	19.81	22.35	24.89	27.43
0.0825	2.10	4.64	7.18	9.72	12.26	14.80	17.34	19.88	22.42	24.96	27.50
0.0850	2.16	4.70	7.24	9.78	12.32	14.86	17.40	19.94	22.48	25.02	27.56
0.0875	2.22	4.76	7.30	9.84	12.38	14.92	17.46	20.00	22.54	25.08	27.62
0.0900	2.29	4.83	7.37	9.91	12.45	14.99	17.53	20.07	22.61	25.15	27.69
0.0925	2.35	4.89	7.43	9.97	12.51	15.05	17.59	20.13	22.67	25.21	27.75
0.0950	2.41	4.95	7.49	10.03	12.57	15.11	17.65	20.19	22.73	25.27	27.81
0.0975	2.48	5.02	7.56	10.10	12.64	15.18	17.72	20.26	22.80	25.34	27.88
	mm										

5. Reference Documents

- NLX Motherboard Specification Revision 1.2
- A.G.P. Specification Revision 1.0
- NLX A.G.P. Form Factor Engineering Change Request (AGP_ECR1.DOC) Dated 04-Apr-97.

6. Suggested Test Plan

Test Log

Tested By: _____

Date: _____

Location: _____

UUT Chassis Details

Manufacturer: _____

Chassis Type: _____

Model/Part Number: _____

Revision: _____

Serial Number: _____

Number and type of drive bays: 3½"ext: _____

5¼"ext: _____

3½"int: _____

5¼"int: _____

Notes: _____

Board Gauge Details

Serial Number: _____

Revision Number: _____

NLX Specification Revision: _____

A.G.P. Specification Revision: _____

Riser Details

Manufacturer: _____

Slots: _____

Description: _____

Part Number, Revision: _____

Serial Number: _____

Pass/Fail, Comments	8 × 10" Board	9 × 10" Board	9 × 11.2" Board	9 × 13.6" Board
Keepout Zones				
I/O Window				
Board Rails				
Fit with Riser				
A.G.P. Board				